



Technology Evaluation Tools: Assessing Technologies for Potential Technology Transfer

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Purposes of Research

Included to benchmark:

- Technology assessment methodology and techniques for technology transfer in U.S.
- Professional experience and education of U.S. managers in charge of technology assessment

Research Design

- Survey using a written questionnaire
- The questionnaire was organized into the following four sections:
 - Section 1. Profile Information
 - Section 2. Technology Assessment for Technology Transfer: Technical Considerations
 - Section 3. Technology Assessment for Technology Transfer: Commercial Considerations
 - Section 4. Application Means of Technology Assessment Methodology (how is technology assessed)

Source of Survey Sample

Sector	Target Sample	Source
University	Office of Technology Transfer in U.S. Universities	Association of University Technology Managers (AUTM)
Federal Laboratory	U.S. Federal Laboratories and National Laboratories involved in technology transfer related activities	Federal Laboratory Consortium (FLC)
Industry	U.S. Companies involved in technology transfer related activities	Licensing Executive Society (LES)

Response Rate

	University	Federal Laboratory	Industry	Total
Number of samples (Initial letters sent)	154	247	389	790
Number of completed questionnaires received	23	47	23	93
Response rate (%)	16.9	21.1	6.7	13.2

Section 1. Profile Information

Federal Laboratory Respondents

	DOE (<i>n</i> = 12)	DOD (<i>n</i> = 18)	Other Federal Labs (<i>n</i> = 17)
Primary responsibility for technology assessment	67%	78%	75%

Note: *n* is the total number of responding organizations in each section

Table 1 Internal Training and External Training

	DOE (<i>n</i> = 12)	DOD (<i>n</i> = 18)	High-Activity Federal Lab (<i>n</i> = 11)
Internal Training (%)	100.0	50.0	45.0
External Training (%)	83.3	50.0	81.8

Note: *n* is the total number of responding organizations in each section.

Section 2.

Technical Considerations

- 2.1 Describing the technology
- 2.2 Assessing the technical impacts of the technology and potential risks
- 2.3 Classifying the technology
- 2.4 Identifying the present stage of the technology development
- 2.5 Identifying the remaining requirements for completion of the development of the technology
- 2.6 Comparing the technology with competing technology

Table 2 Technical Considerations

Technical Consideration	DOE (<i>n</i> = 12)	DOD (<i>n</i> = 18)	High-Activity Federal Lab (<i>n</i> = 11)
2.1 Describe technology	91.7	77.8	90.9
2.2 Assess technical impacts and risks	25.0	38.9	45.5
2.3 Classify technology	58.3	27.8	54.5
2.4 Identify present stage of tech dev.	83.3	61.1	90.9
2.5 Identify remaining requirement	58.3	38.9	72.7
2.6 Compare technology	75.0	55.6	72.7

Note: *n* is the total number of responding organizations in each section.
Four of eleven high-activity federal labs are DOE.

Table 2.1 Considerations for Technology Description

Technical Considerations	DOE (<i>n</i> = 11)	DOD (<i>n</i> = 14)	High-Activity Federal Lab (<i>n</i> = 10)
Function	100.0	92.9	90.0
Performance	100.0	92.9	100.0
Compatibility	90.9	78.6	80.0
Means of protection	90.9	78.6	100.0
Impact on product	81.8	71.4	60.0
Technical strengths and weaknesses	100.0	92.9	80.0

Note: *n* is the number of organizations that describe the technology.

Table 2.2 Tools/Techniques for Assessing Technical Impacts and Risks

Tools/Techniques	DOE (<i>n</i> = 3)	DOD (<i>n</i> = 7)	High-Activity Federal Lab (<i>n</i> = 5)
Technology adoption life cycle	33.3	71.4	80.0
Technology forecasting	100.0	42.9	60.0
Value chain analysis	100.0	28.6	40.0
Matching business and technology portfolio	33.3	42.9	60.0

Note: *n* is the number of organizations that assess technical impacts.

Table 2.3 The Use of Technology Classifications

Technology Classifications	DOE (<i>n</i> = 7)	DOD (<i>n</i> = 5)	High-Activity Federal Lab (<i>n</i> = 6)
Disruptive vs. sustaining technology	42.9	60.0	50.0
Basic vs. key technology	85.7	100.0	83.3
Product/service, process, and information technology	71.4	80.0	100.0

Note: *n* is the number of organizations that classify the technology.

Table 2.4.1 Considerations for Technology Development Stages

Considerations	DOE (<i>n</i> = 10)	DOD (<i>n</i> = 11)	High-Activity Federal Lab (<i>n</i> = 10)
Incomplete vs. complete technology	80.0	63.6	80.0
Science, technology, or engineered product	80.0	81.8	80.0
Emerging, pacing or mature technology	70.0	72.7	60.0
Technology readiness level	50.0	72.7	60.0

Note: *n* is the number of organizations that identify stages of tech dev.

Table 2.4.2 Tools for Identifying the Present Stage of Technology Development

Tools	DOE (<i>n</i> = 10)	DOD (<i>n</i> = 11)	High-Activity Federal Lab (<i>n</i> = 10)
Technology life cycle	60.0	27.3	50.0
Technology S-curve	20.0	9.1	20.0
DOE/NSF basic definitions	30.0	0.0	20.0
DoD basic definitions	20.0	63.6	20.0

Note: *n* is the number of organizations that identify stage of tech dev.

Table 2.5 Tools for Identifying the Remaining Requirements

Tools	DOE (<i>n</i> = 7)	DOD (<i>n</i> = 7)	High-Activity Federal Lab (<i>n</i> = 8)
Technology road map	85.7	57.1	75.0
Technology development schedule	28.6	71.4	62.5
Product development project map	42.9	42.9	37.5

Note: *n* is the number of organizations that identify remaining requirements.

Table 2.6 Tools/Techniques for Comparing the Technology

Tools/Techniques	DOE (<i>n</i> = 9)	DOD (<i>n</i> = 10)	High-Activity Federal Lab (<i>n</i> = 8)
Compare technical strengths	88.9	90.0	100.0
Compare technical weaknesses	88.9	90.0	87.5
Compare transfer ability	55.6	90.0	75.0
Product/technology matrix	22.2	0.0	25.0

Note: *n* is the number of organizations that compare the technology.

Section 3.

Commercial Considerations

- 3.1 Identifying potential commercial applications of the technology
- 3.2 Identifying potential markets for commercial applications of the technology
- 3.3 Identifying potential technology acquirers
- 3.4 Estimating commercialization related costs
- 3.5 Pricing the technology
- 3.6 Developing a business plan for commercial assessment of the technology

Table 3 Commercial Considerations

Commercial Consideration	DOE (<i>n</i> = 12)	DOD (<i>n</i> = 18)	High-Activity Federal Lab (<i>n</i> = 11)
3.1 Identify commercial application	58.3	61.1	81.8
3.2 Identify markets	50.0	66.7	81.8
3.3 Identify technology acquirers	66.7	72.2	81.8
3.4 Estimate related costs	41.7	16.7	36.4
3.5 Price technology	41.7	38.9	63.6
3.6 Develop a business plan	41.7	22.2	45.5

Note: *n* is the total number of responding organizations in each section. Four of eleven high-activity federal labs are DOE.

Table 3.1 Techniques for Identifying Commercial Applications

Techniques	DOE (<i>n</i> = 7)	DOD (<i>n</i> = 11)	High-Activity Federal Lab (<i>n</i> = 9)
Determine primary field of use	100.0	81.8	88.9
Determine secondary field of use	100.0	54.5	66.7
Assess commercial strengths	85.7	72.7	88.9
Assess commercial weaknesses	85.7	72.7	77.8

Note: *n* is the number of organizations that identify commercial applications.

Table 3.2 Techniques for Identifying Markets

Techniques	DOE (<i>n</i> = 6)	DOD (<i>n</i> = 12)	High-Activity Federal Lab (<i>n</i> = 9)
Conduct primary marketing research	100.0	75.0	66.7
Conduct secondary marketing research	100.0	58.3	88.9

Note: *n* is the number of organizations that identify markets.

Table 3.3.1 Techniques for Identifying Technology Acquirers

Techniques	DOE (<i>n</i> = 8)	DOD (<i>n</i> = 13)	High-Activity Federal Lab (<i>n</i> = 9)
Identify a customer group that has potential interest in the technology	87.5	84.6	88.9
Search for a company who is doing the research in the same area	87.5	61.5	88.9
Send out a non-confidential abstract to potential technology acquirers	87.5	46.2	88.9
Focus on existing market of competing technology	87.5	46.2	88.9

Note: *n* is the number of organizations that identify technology acquirers.

Table 3.3.2 Means for Marketing the Technology

Commercial Consideration	DOE (<i>n</i> = 8)	DOD (<i>n</i> = 13)	High-Activity Federal Lab (<i>n</i> = 9)
Trade fair	87.5	61.5	66.7
Trade magazine	62.5	46.2	55.6
Brochure	62.5	53.8	55.6
Organizational website	87.5	92.3	77.8
Direct marketing	62.5	61.5	77.8

Note: *n* is the number of organizations that identify technology acquirers.

Table 3.4 Techniques for Estimating Commercialization Related Costs

Techniques	DOE ($n = 5$)	DOD ($n = 3$)	High-Activity Federal Lab ($n = 7$)
Estimate remaining cost of completion of the development of the technology for licensor	80.0	100.0	75.0
Estimate remaining cost of completion of the development of the technology for licensee	100.0	100.0	100.0
Estimate cost of market development for licensee/acquirer	80.0	66.7	75.0
Estimate cost including personnel support of licensee/acquirer in transferring the technology	80.0	66.7	75.0

Note: n is the number of organizations that estimate commercialization related costs.

Table 3.5 Technology Pricing Approaches

Approaches	DOE (<i>n</i> = 5)	DOD (<i>n</i> = 7)	High-Activity Federal Lab (<i>n</i> = 7)
Cost	60.0	71.4	71.4
Income	100.0	57.1	71.4
Market	100.0	57.1	85.7
Customary/Industry standard	80.0	28.6	71.4

Note: *n* is the number of organizations that price the technology.

Table 3.6 Elements for Development a Business Plan

Elements	DOE (<i>n</i> = 5)	DOD (<i>n</i> = 4)	High-Activity Federal Lab (<i>n</i> = 5)
Marketing plan	100.0	100.0	80.0
Financial plan	80.0	75.0	80.0
Production plan	20.0	50.0	20.0
Technology development plan	100.0	100.0	80.0
Organizational and staffing plan	80.0	25.0	60.0
Risk assessment	80.0	50.0	40.0
Competitive analysis	60.0	75.0	60.0

Note: *n* is the number of organizations that develop a business plan.

Section 4. Application Means

Table 4.1 Application Means of Technology
Assessment Methodology: Technical Considerations

Technical Consideration	By a single person	By an inside team	By an outside team
2.1 Describe technology	44.7	51.1	6.4
2.2 Assess technical impacts and risks	17.0	46.8	23.4
2.3 Classify technology	19.1	34.0	4.3
2.4 Identify present stage of tech dev.	29.8	53.2	8.5
2.5 Identify remaining requirement	29.8	48.9	19.1
2.6 Compare technology	25.5	38.3	29.8

Note: The calculation is based on 47 federal laboratory respondents. 26

Table 4.2 Application Means of Technology Assessment Methodology: Commercial Considerations

Commercial Consideration	By a single person	By an inside team	By an outside team
3.1 Identify commercial application	29.8	46.8	31.9
3.2 Identify markets	31.9	46.8	38.3
3.3 Identify technology acquirers	23.4	40.4	34.0
3.4 Estimate related costs	8.5	27.7	25.5
3.5 Price technology	14.9	21.3	21.3
3.6 Develop a business plan	8.5	17.0	23.4

Note: The calculation is based on 47 federal laboratory respondents.

Federal Lab Documentation

- 62.2% of respondents indicated systematic technology assessment methodology for technology
- 40% of respondents indicated technology assessment methodology was generally documented
- 20% of respondents indicated there was some form of technology checklist or document to summarize the process/methodology

Limitations of Study

- Survey responses may include perception rather than fact
- Terminology interpretation issues

Closing Thoughts

- Benchmarking provides a starting point for systematically developing good practices
- The technology transfer discipline is relatively new and its importance demands more effective techniques and methodologies
- Research/Documentation is important to the continued progress of the discipline